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Editorial

Recent trends in intelligent data analysis

Intelligent Data Analysis deals with the visualization, pre-processing, pattern recognition and knowledge discovery tools and applications using various computational intelligence techniques. The ten papers included in this special issue represent a selection of extended contributions presented at the 6th International Conference on Hybrid Artificial Intelligence Systems (HAIS), held in Wroclaw, Poland, during May 2011. The papers discuss the development of new data analysis methodologies with a focus on neurocomputing and connectionist learning. Articles were selected on the basis of fundamental ideas and concepts rather than the direct usage of well-established techniques. This special issue is aimed at practitioners, researchers and post-graduate students, who are engaged in developing and applying, advanced Hybrid Artificial Intelligence Systems from a theoretical point of view and also to solve real-world problems. The papers are organized as follows.

Martínez et al. in the first contribution apply principal component analysis for quantitative association rules' quality. From this analysis, a reduced subset of measures is selected to be included in the fitness function in order to obtain better values for the whole set of quality measures, and not only for those included in the fitness function. This is a general-purpose methodology and can, therefore, be applied to the fitness function of any algorithm.

The second contribution by López et al. introduces the usage of the Iterative Instance Adjustment for Imbalanced Domains. It is an evolutionary optimization based framework, which uses an instance generation technique, designed to face the existing imbalance modifying the original training set. The method iteratively learns the appropriate number of examples that represent the classes and their particular positioning. The learning process contains three key operations in its design: a customized initialization procedure, an evolutionary optimization of the positioning of the examples and a selection of the most representative examples for each class.

Lysiak et al. in the sequel propose a new probabilistic model using measures of classifier competence and diversity. The multiple classifier system based on the dynamic ensemble selection scheme was constructed using both developed measures. Two different optimization problems of ensemble selection are defined and a solution based on the simulated annealing algorithm is presented. The influence of minimum value of competence and diversity in the ensemble on classification performance was investigated.

In the fourth contribution, Krawczyk and Wozniak deal with the problem of designing combined recognition system based on a pool of individual one-class classifiers. The authors proposed

a new model dedicated to the one-class classification and also introduced a novel diversity measures dedicated to it. The proposed model of a one-class classifier committee may be used for single-class and multi-class classification tasks.

In the sequel Cano et al. propose a parallel evaluation model of rules and rule sets on GPUs based on the NVIDIA CUDA programming model, which significantly allows reducing the run-time and speeding up the algorithm. The GPU model achieved a rule interpreter performance of up to 64 billion operations per second and provides a significant advantage to deal complex problems where the CPU run-time is not acceptable.

Martínez-Murcia et al. in the sixth paper illustrate a new CAD system based on pre-processing, voxel selection, feature extraction and classification of the images. After pre-processing of the images, voxels are ranked by means of their significance in class discrimination, and the first N are selected. Then, these voxels are modeled using Independent Component Analysis (ICA), obtaining a few components that represent each image, which is used later to train a classifier.

In the seventh paper, Maiores et al. provide an active Learning based interactive image segmentation system, which allows quick volume segmentation, with minimal intervention of a human operator. Image segmentation is achieved by a Random Forest (RF) classifier applied on a set of image features extracted from each voxel and its neighborhood. An initial set of labeled voxels is required to start the process, training an initial RF. The most uncertain unlabeled voxels are shown to the human operator to select some of them for inclusion in the training set, retraining the RF classifier.

The following contribution by Cyganek and Gruszczynski presents a hybrid visual system for monitoring driver's states of fatigue, sleepiness and in-attention based on driver's eye recognition. Safe operation in car conditions and processing in daily and night conditions are obtained using a custom setup of two cameras operating in the visible and near infrared spectra, respectively. In each of those spectra images a cascade of two classifiers performs processing. The first classifier is responsible for detection of eye regions based on the proposed eye models specific to each spectrum. The second classifier in each cascade is responsible for eye verification. It is based on the higher order singular value decomposition of the tensors of geometrically deformed versions of real eye prototypes, specific to the visible and NIR spectra, respectively.

In the sequel, Calvo-Rolle and Corchado present a novel bio-inspired knowledge system, based on closed loop tuning, for calculating the Proportional-Integral-Derivative (PID) controller parameters of a real combined cycle plant. The aim is to automatically achieve the

best parameters according to the work point and the dynamics of the plant.

In the last contribution Lee and Cho presented a method to recognize a person's activities from sensors in a mobile phone using mixture-of-experts (ME) model. In order to train the ME model, the authors have applied global-local co-training algorithm with both labeled and unlabeled data to improve the performance.

We would like to thank our peer-reviewers for their diligent work and efficient efforts. We are also grateful to the Editor-in-Chief of Neurocomputing, Prof. Tom Heskes, for his continued support for the HAIS conference and for the opportunity to organize this Special issue.

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Guest Editors

Emilio Corchado*

Departamento de Informática y Automática, Universidad de Salamanca, Plaza de la Merced S/N, 37008, Salamanca, Spain
E-mail address: escorchado@usal.es

Emilio Corchado*, Ajith Abraham, Václav Snášel
IT4Innovations, European Center for Excellence, VSB-Technical University of Ostrava, 17. listopadu 15, 70833 Ostrava, Poruba, Czech Republic

E-mail addresses: escorchado@usal.es (E. Corchado),
ajith.abraham@ieee.org (A. Abraham),
vaclav.snasel@vsb.cz (V. Snášel).

Michał Woźniak
*Wroclaw University of Technology, Wybrzeże Wyspińskiego 27,
50-370 Wroclaw, Poland*
E-mail address: michal.wozniak@pwr.wroc.pl

Ajith Abraham
*Machine Intelligence Research Labs (MIR Labs), Scientific Network for
Innovation and Research Excellence, P.O. Box 2259 Auburn,
Washington 98071, USA*
E-mail address: ajith.abraham@ieee.org

André C.P.L.F. de Carvalho
*Department of Computer Science, University of Sao Paulo at Sao
Carlos, Sao Carlos, SP, Brazil*
E-mail address: andre@icmc.usp.br

Václav Snášel
VŠB-TU Ostrava, 17. listopadu 15, 70833 Ostrava, Czech Republic
E-mail address: vaclav.snasel@vsb.cz

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* Corresponding author at: Departamento de Informática y Automática, Universidad de Salamanca, Plaza de la Merced S/N, 37008 Salamanca, Spain. Tel.: +34 630736755.